110480

SHEET 1 OF

APPLICATION			QTY REQD	
DASH NO	NEXT ASSY	USED ON	NEXT ASSY	FINAL ASSY

ACCEPTANCE TEST PROCEDURE
FOR A
MISSILEBORNE TELEVISION SYSTEM

DATE ____________

SERIAL NO. ____________

HED VERIFICATION ____________

CVA " ____________

DR BY C.L. Olson	4/18/61	
CHK BY	5-23-61	
APPD BY		
APPD BY C. Olson	4/19/61	
APPD BY	4/19/61	
REL	4/19/61	CODE IDENTIFICATION NO. 98438

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ELECTRONICS DIVISION
THE SIEGLER CORPORATION
ANAHEIM CALIFORNIA

DWG SIZE A	110480
	SHEET 1 OF

ENG FORM 601 (REV 8-60)

REVISIONS

SYM	EFF ON	SHEET	DESCRIPTION	DISPOS	APPROVAL	DATE
			1– MAY BE REWORKED 2– CANNOT BE REWORKED 3–NOW SHOP PRACTICE 4– RECORD CHANGE 5–PARTS MADE OK			
		8	Add Paragraph 5.7.7		C Olson	4/20
		8	Change paragraphs 5.7.4 & 5.7.5 to show Initial Values and Value after 1 hour operation.		C Olson	4/20
	A	Fig.5	Change figure 5 to show camera control and transmitter in separate ovens.		C L Olson M Shriver	4/20 4/20/6
	B		Revised and redrawn and corrected		C. Olson M Shriver	4/23/61 5/23/6
	C		Pages 3, 6, and 11 new sheets.			
	C	5	5.2.1 - Added clipping level.			
	C	5	5.2.3 - Changed deviation formula.			
	C	7	5.4.1 - Was figure 3.			
	C	9	5.5.1 - Added 1/2" level.			
	C	10	5.7.1 - Was test pattern No. 1.			

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ENG FORM 601e (REV 8-60)

1.0 SCOPE

This procedure is designed to ensure operational compliance of the Missileborne Television System to Convair Astronautics Report No. 55-01144.

1.1 The following components of the television system are included in this procedure. These components shall be connected together as shown in figures 1 through 7, and shall be tested as a system:

55-01160-1	Strobe Light, Missileborne Television
55-01161-1	Transmitter, Missileborne Television
55-01159-1	Camera Control, Missileborne Television
55-01162-1	Camera, Missileborne Television

2.0 APPLICABLE DOCUMENTS

The following documents and specifications are applicable to this procedure

2.1 Convair Astronautics Specification 55-01144, Rev. A., System Television Instrumentation, Missileborne and Ground, Specification for.

2.2 Convair Astronautics Specification Control Drawings:

55-01160	Strobe Light, Missileborne Television
55-01161	Transmitter, Missileborne Television
55-01159	Camera Control, Missileborne Television
55-01162	Camera, Missileborne Television

3.0 TEST EQUIPMENT REQUIRED

*Oscilloscope	Tektronics RM15
*Slow Scan TV Monitor	HED 108066
*Data Camera	Automax G4RH
*Receiver	Nems-Clarke 1412 modified to HED 110468
*Video Processing Panel	HED 108049
*Dummy Load 50 ohms 20 W	
Frequency Counter	Berkley 7370
Frequency Converter	Berkley 7573
1/2, 1 and 2 inch Lens	HED 612, 610, 620
Directional Coupler	20 db Coupling
RF Voltmeter	Hewlett Packard 410B
Light Meter	Photovolt No. 240
Test Patterns	(1) EIA Standard TV Test Pattern - 6 1/2 inches high (2) EIA Linearity Ball Chart (3) EIA Standard TV Test Pattern - 10 inches high (4) EIA Grey Scale (5) EIA 2 inch Test Pattern
Spectrum Display Unit	Nems-Clarke 200-3

*This equipment is all incorporated in a Ground Recording & Checkout System 55-05120.

4.0 TEST CONDITIONS

4.1 Test Power

27.5 volts DC ±10%
115 volts AC ±10%, 60 CPS

4.2 Ambient temperature shall be between 70°F and 95°F with relative humidity of less than 90%.

5.0 TEST PROCEDURE

The following paragraphs outline the test to be conducted to verify proper operation of the system:

5.1 Transmitter Characteristic Test

5.1.1 Connect the components as shown in Fig. 1.

5.1.2 Turn the equipment on and allow a 5-minute warmup. The test equipment shall have been operating for 15 minutes prior to the test.

5.1.3 Measure the transmitter power output at 27.5 ± .25 volts DC and 24.75 ± .25 volts DC input.

	Should be	Actual	
Power Output	10 W (min.) 27.5 ± .25 VDC	8.6 watts	8.6
	8 W (min.) 24.75 ±.25 VDC	6.8 watts	7.0

5.1.4 Measure the transmitter center frequency.

	Should be	Actual
Frequency	247.8 MC ±.01%	247.790 MC 247.802

5.1.5 Measure the transmitter deviation as follows:

Set the oscillator for 51,979 ±100 CPS. Observe the carrier level at the Spectrum Display Unit as the amplitude of the signal source is raised. Measure the output level of the signal source when the carrier drops to zero level for the first time. Record this voltage level and the voltage level at the receiver output. Do not readjust receiver output voltage between 5.1.5 and 5.2.3.

	Should be	Actual
Transmitter input voltage level for ± 125 KC deviation	1.4 ±0.14 volts P/P .48	1.3 V P/P
Receiver output voltage	1.35 v P/P	2.33 V P/P

5.2 Picture Quality Test

5.2.1 Install the 1-inch lens on the camera.

Connect the system components as shown in Fig. 2; turn power on and allow 5 minutes for warmup. The test equipment required to conduct this test shall have been operating for at least 15 minutes prior to this. Measure the clipping level of the camera composite video.

	Should be	Actual	
Clipping Level	1.4 to 1.6 VPP	1.5 VPP	1.6

5.2.2 Measure the receiver output voltage with an all-white saturated video picture.

Receiver output voltage	1.55	~~2.7~~ V P/P

5.2.3 Calculate system frequency deviation with an all-white saturated picture as follows:

$$\frac{\text{Receiver output voltage 5.2.2} \times 250\text{ KC}}{\text{Receiver output voltage 5.1.5}} = \text{Saturated video deviation}$$

Should be	Actual	
225 to 315 KC P/P	289 KC P/P	280

5.2.4 Adjust the lens for best picture as seen on the TV monitor when focused on the light box with pattern No. 1 installed. Once adjusted, the lens shall not be readjusted during the tests through 5.2.11.

5.2.5 Observe the following characteristics on the TV monitor:

	Should be	Actual	
Horizontal Resolution	350 lines min.	450 lines	500
Vertical Resolution	350 lines min.	400 lines	450
Shading	No visible degradation in flatness of field top to bottom, left to right.	✓ O.K.	✓

5.2.6 Replace the pattern No. 1 with pattern No. 2.

5.2.7 Observe the picture on the TV monitor. Linearity ✓ ✓ O.K.

5.2.8 Record this picture on film using kinescope recorder.

Picture Number 2 1

5.2.9 Replace pattern no. 2 with pattern No. 4

5.2.10 Adjust only the ground equipment for best picture on the TV monitor.

	Should be	Actual
Grey Scale	5 shades min.	8 Shades 8

5.2.11 Record this picture on film using kinescope recorder.

Picture Number 3 2

5.3 System Low Temperature Test

5.3.1 With the equipment installed in the temperature chambers as shown in Fig. 3, reinstall pattern No. 1 and adjust the lens for the best picture as seen on the TV monitor.

NOTE: Once adjusted the lens shall not be re-adjusted during tests 5.3 and 5.4. Close the camera temperature chamber and record this picture on film using the kinescope recorder.

Picture Number 4 3

NOTE: The camera temperature chamber shall not be opened until completion of 5.3 and 5.4.

5.3.2 Reduce the temperature in all chambers to 0°F ± 2 and soak at this temperature for 2 hours.

5.3.3 Set input voltage to all units at 24.75 VDC + .25 - 0 volts and turn system on. Allow a 5-minute warmup period.

5.3.4 Note that all units are operating by observing the picture on the TV monitor and the pulsing input current to strobe light.

Operating

Camera & Transmitter Assemblies Yes ✓ ✓ NO________

Strobe Light Yes ✓ ✓ No________

2.25 → 6 A

5.3.5 Monitor and record the following functions:

Function	Reading	
1. DC input voltage to system consisting of the television transmitter and camera assemblies	24.75 VDC	24.75
2. Transmitter Frequency. Remove the video from the transmitter for this test.	247.795 MC	247.808
3. Transmitter Power	6.0 Watts	7.00

5.3.6 Record the picture characteristics on the kinescope recorder.

Picture Number 5 4

5.4 System High Temperature Test

5.4.1 Assemble the equipment as shown in Fig. 4.

5.4.2 Adjust the temperature as follows and soak for 2 hours.

(a) Camera + 110°F ± 2°.

(b) Camera Control & Transmitter + 130°F ±2°.

(c) Strobe Light + 160°F ± 2°.

NOTE: The Strobe Light must be connected to a heat sink capable of dissipating 150 watts at a temperature not to exceed 110°F at Flange.

5.4.3 Adjust the input power for 30.25 +0 - .25 VDC and turn equipment on. Allow a 5-minute warmup period.

5.4.4 Note that all units are operating by observing the picture on the monitor and the pulsing input current to Strobe Light.

	Initial Operation	After 1 hour
Camera, Camera Control & Transmitter	✓ Yes ✓ No____	Yes ✓ No____
Strobe Light	✓ Yes ✓ No____	Yes ✓ No____

5.4.5 Monitor and Record the following functions:

Function	Reading	After 1 Hour
1. DC input voltage to system consisting of Camera & transmitter assemblies	30.25 30.25 VDC	✓ 30.25 VDC
2. Transmitter Frequency Remove video from the transmitter for this test.	242.797 242.799 MC	24 242.796 MC
3. Transmitter Power	9.5 Watts 10.5	9.5 Watts

5.4.6 Record the picture characteristics on the kinescope recorder.

Picture Number 536
[illegible]

5.4.7 Average skin temperature on each unit shall be a minimum as follows:

Camera 110°F	One Thermocouple
Camera Control 130°F	Average of two thermocouples
Transmitter 130°F	Average of three thermocouples
Strobe Light 160°F	On cover one thermocouple

The strobe light flange temperature shall not exceed 110°F as measured by one thermocouple attached to flange.

Average skin temperature:

Camera	112 °F.	117
Camera Control	132 °F.	131
Transmitter	140 °F.	146
Strobe Light	162 °F.	160
Strobe Light Flange	110 °F.	105

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5.4.8 After one hour continuous operation repeat 5.4.4, 5.4.5, 5.4.6.

5.5 System Vibration Test

5.5.1 Assemble the equipment as shown in Fig. 5. Install test pattern No. 5 on front of 1/2" lens.

5.5.2 Set the input voltage for 27.5 ± .25 VDC and turn the equipment on.

5.5.3 Vibrate the equipment in the axis parallel to the equipment's major axis or center line at a constant octave sweeping mode from 5 to 2000 CPS in 40 minutes. It shall be constant amplitude of .25 inches pp from 5 to 15 CPS and constant acceleration of 3 G's from 10 to 2000 CPS.

5.5.4 Monitor and record the following functions before and after the vibration test. Observe the picture visually during the test to determine equipment malfunction or picture deterioration.

Function	Reading Before	Reading After
1. DC input to system consisting of transmitter and camera assemblies.	27.5 27.5 VDC	✓ 27.5 VDC
2. Transmitter Frequency (Remove 28 VDC to camera monentarily for this measurement)	247.804 247.797 MC	247.808 247.797 MC
3. Transmitter Power	8.5 Watt 8.6	8.5 Watt

Picture during vibration

825, 1350 & 1400 cycles

Picture is affected

1400 to 2000 cycle picture deterioration

4. Record the picture on the kinescope recorder before the test and after the test with the vibration table off.

Picture Number (Before) 8

Picture Number (After) 9

5.6 Strobe Light Intensity Test

5.6.1 With the equipment connected as shown in Fig. 6 proceed with the following:

a. Adjust the variac for a light intensity of 500 ft. candle on light meter. NOTE: DC MV level on oscilloscope.

b. Install the times 2 light multiplier on light meter pick-up and note that the DC level on oscilloscope has been reduced by 2.

5.8

1000 ft. candle = 6 MVDC

c. Remove the 1000 ft. candle light source and measure the pulsing peak voltage of the strobe light on the oscilloscope.

20 mV

15 MV DC

Strobe light intensity = $\frac{\text{Item c}}{\text{Item b}}$ x 1000

	Should be	Actual
	2000 ft. candles min. at 10 ft.	2500 ft. candle

5.7 System Compatibility Test

5.7.1 Connect the system as shown in Fig. 7 using test pattern No. 3.

5.7.2 Turn the system on and allow a 5-minute warmup. The test equipment shall have been operating for 15 minutes prior to this test.

5.7.3 Adjust the lens for best picture, viewing the test pattern and observe the picture on the TV monitor.

5.7.4 Observe the following picture characteristics on the monitor:

	Should be	Actual
Horizontal Resolution	350 lines min.	450 lines
Vertical Resolution	350 lines min.	400 lines
Shading	No visible degradation in flatness of field top to bottom, left to right.	[illegible] O. K.

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5.7.5 Using the kinescope recorder, record this picture on film.

Picture Number 10

5.8 Film Verification

5.8.1 Remove the film exposed during tests and develop. Pick one frame from each sequence and enlarge to 8 x 10 inches. Examine these films and note as follows:

Picture #	Reference Paragraph	Remarks
	5.2.8	
	5.2.11	
	5.3.1	
	5.3.6	
	5.4.6	
	5.4.8	
	5.5.4	
	5.5.4	
	5.7.5	

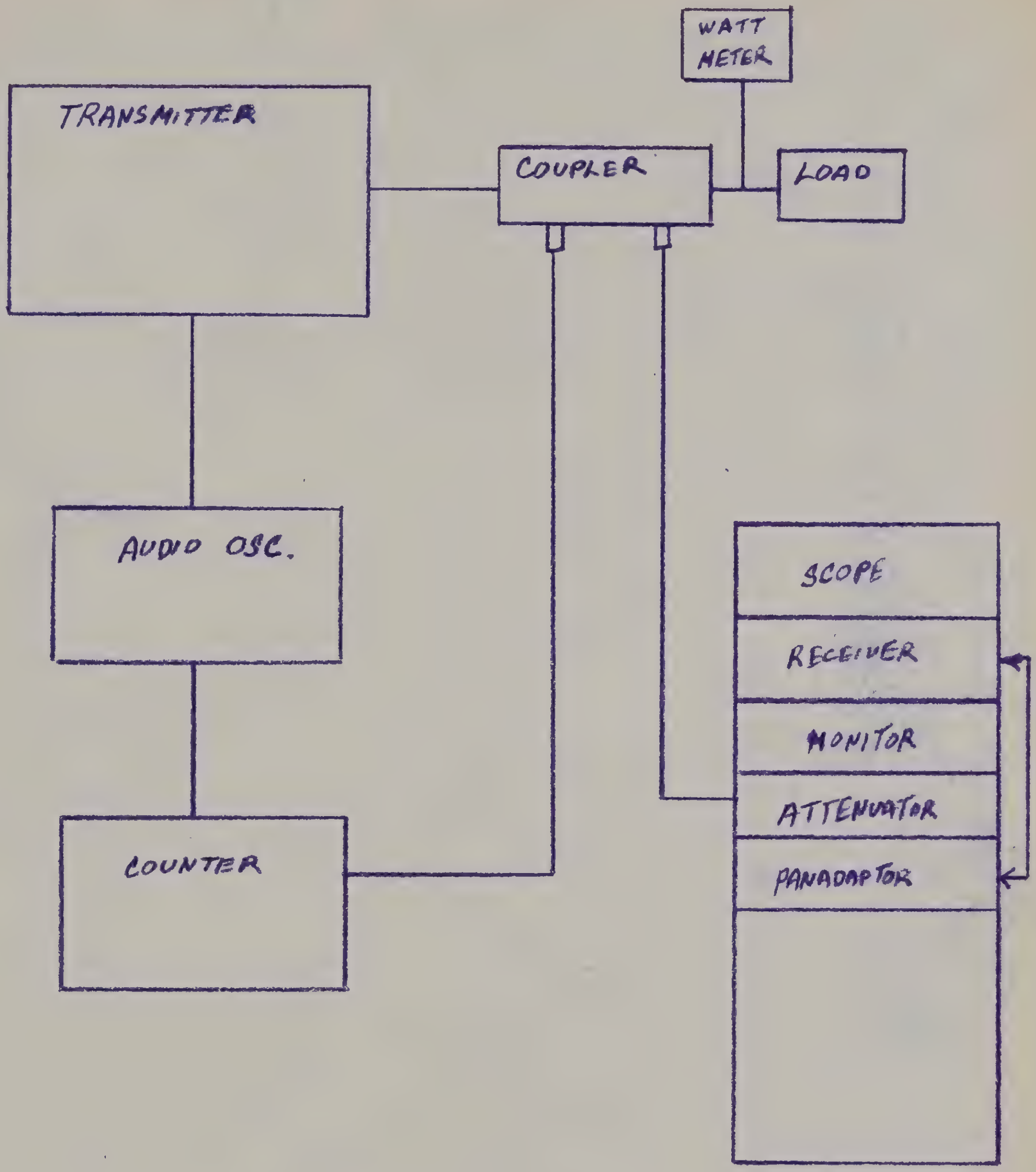

FIGURE 1

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DWG	CODE IDENT. NO. 98438	
A	110480	
SIZE	SHEET 12	

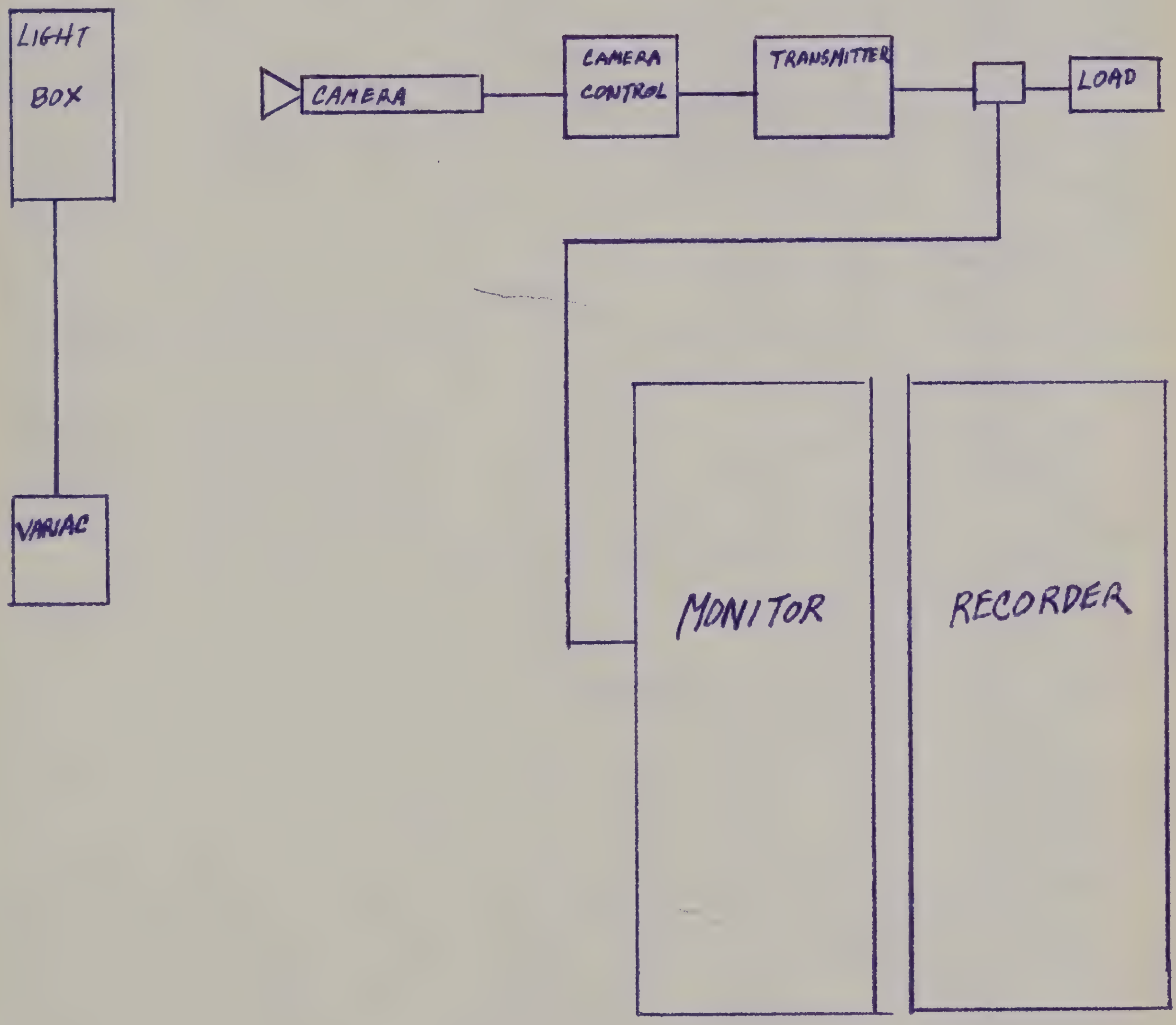

FIGURE 2

HALLAMORE ELECTRONICS DIVISION
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DWG
A
SIZE

CODE IDENT. NO. 98438
110480
SHEET 13

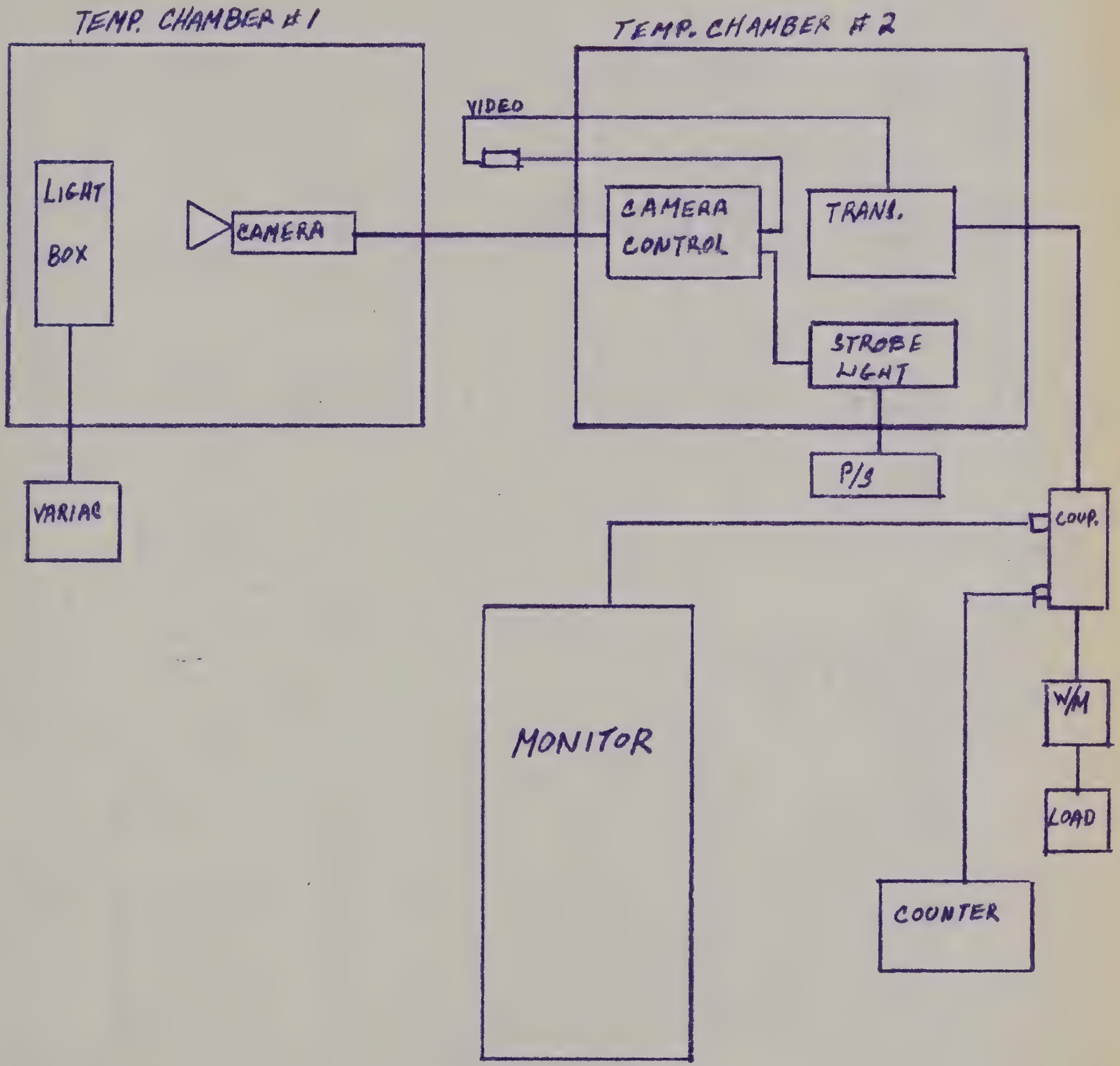

FIGURE 3

HALLAMORE ELECTRONICS DIVISION
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DWG	CODE IDENT. NO. 98438	
A	110480	
SIZE	SHEET 14	

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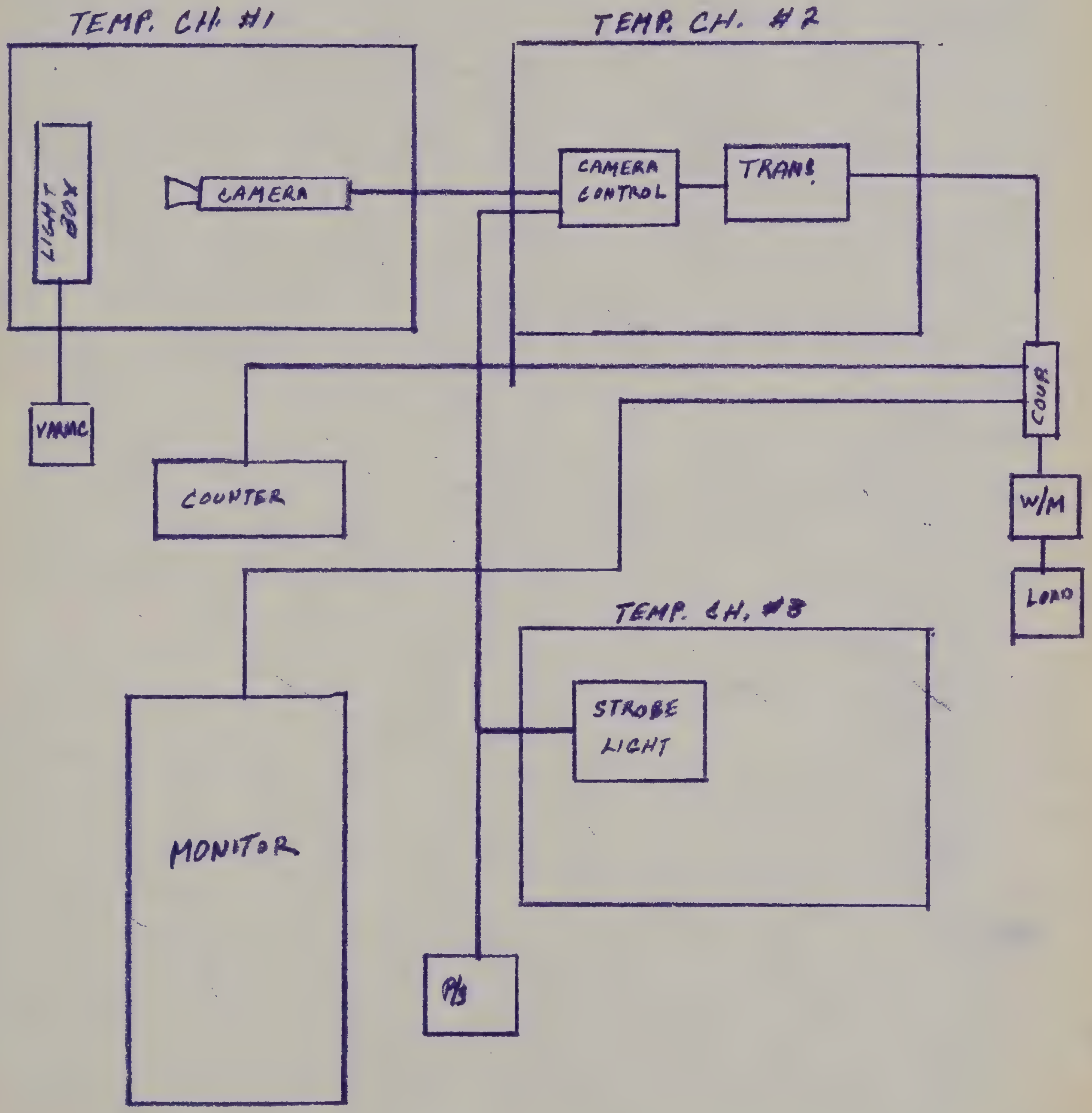

FIGURE # 4

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DWG SIZE A
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SHEET 15

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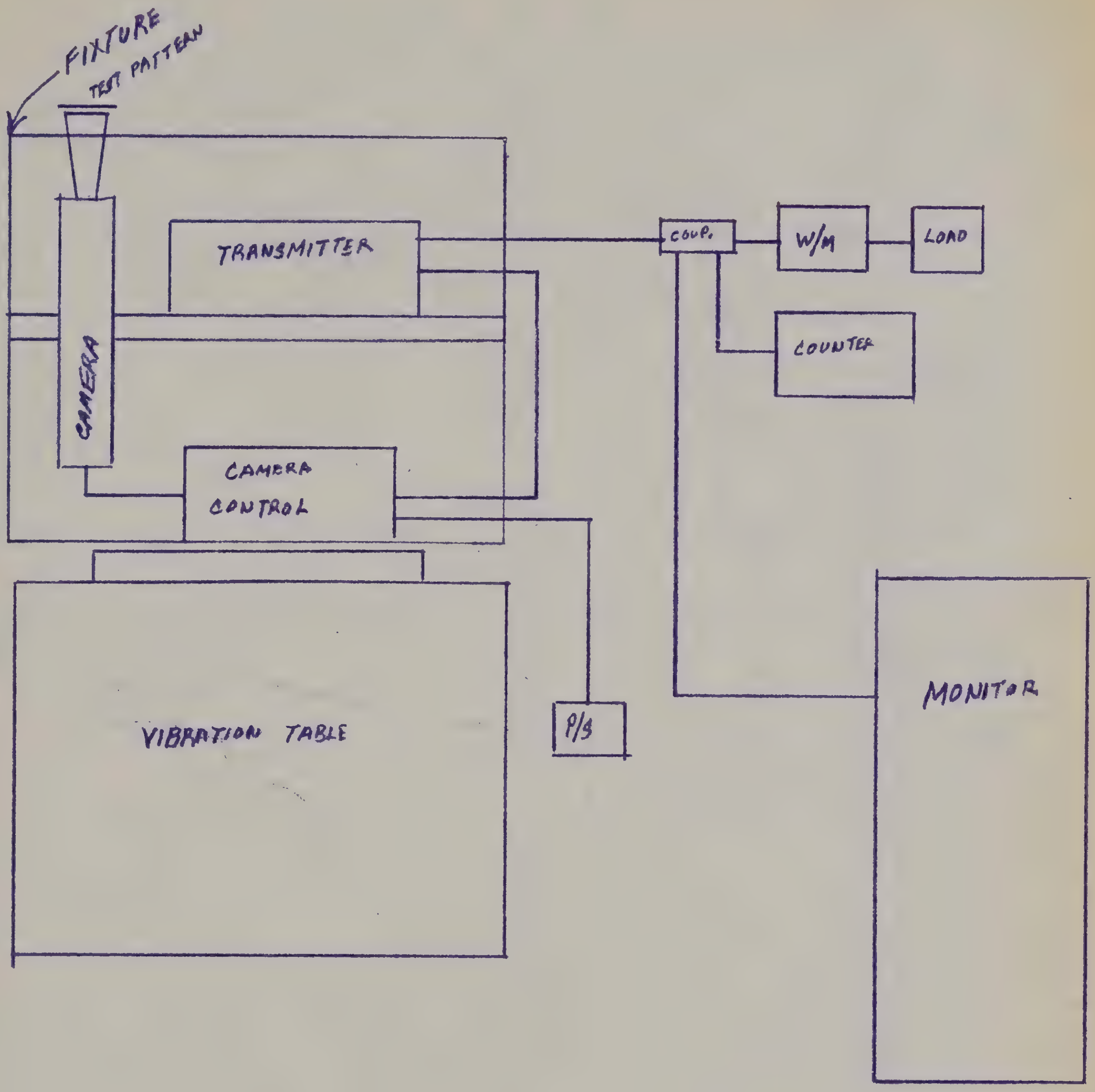

FIG #5

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DWG SIZE A
CODE IDENT. NO. 98438
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SHEET 16

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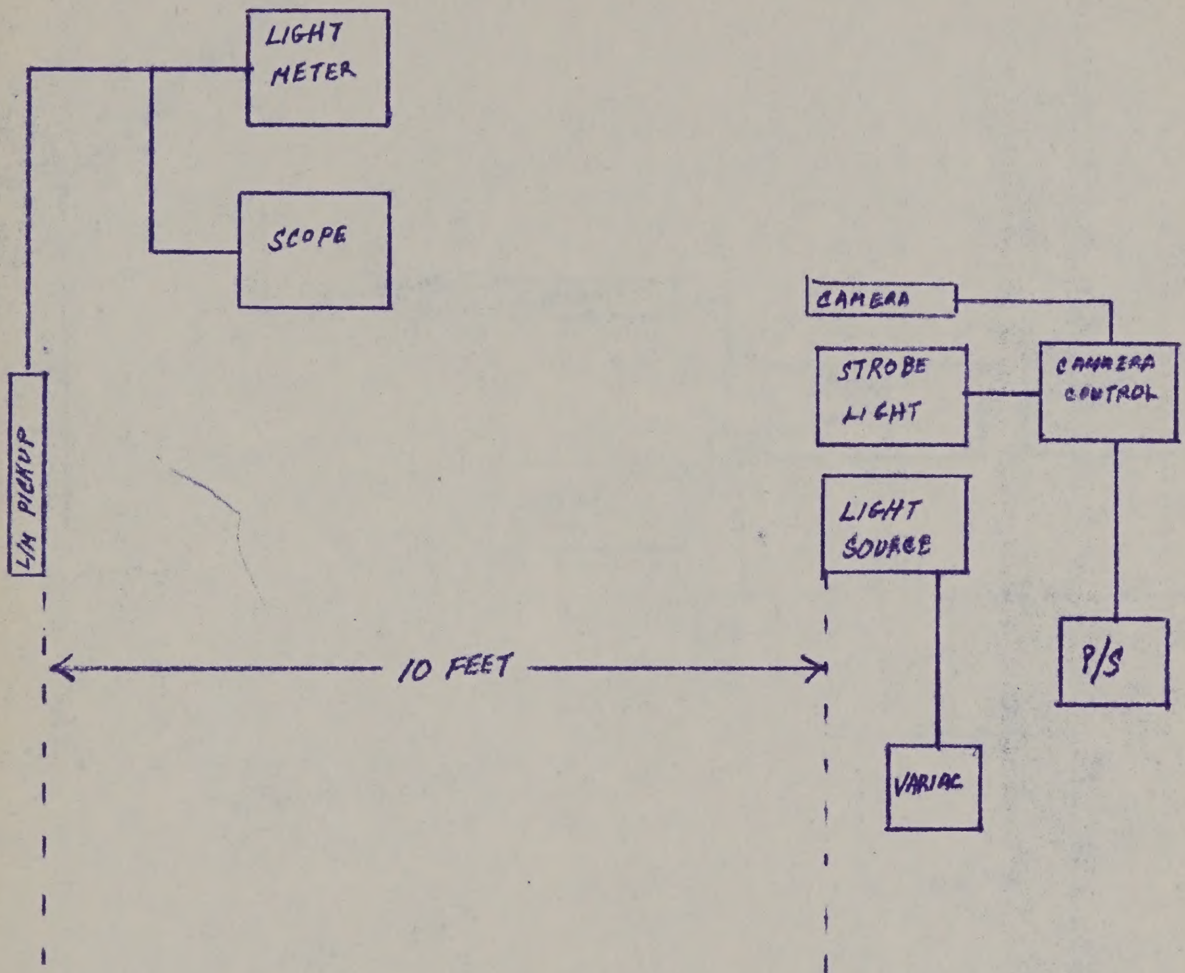

FIG #6

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DWG	CODE IDENT. NO. 98438	
A	110480	
SIZE	SHEET 17	

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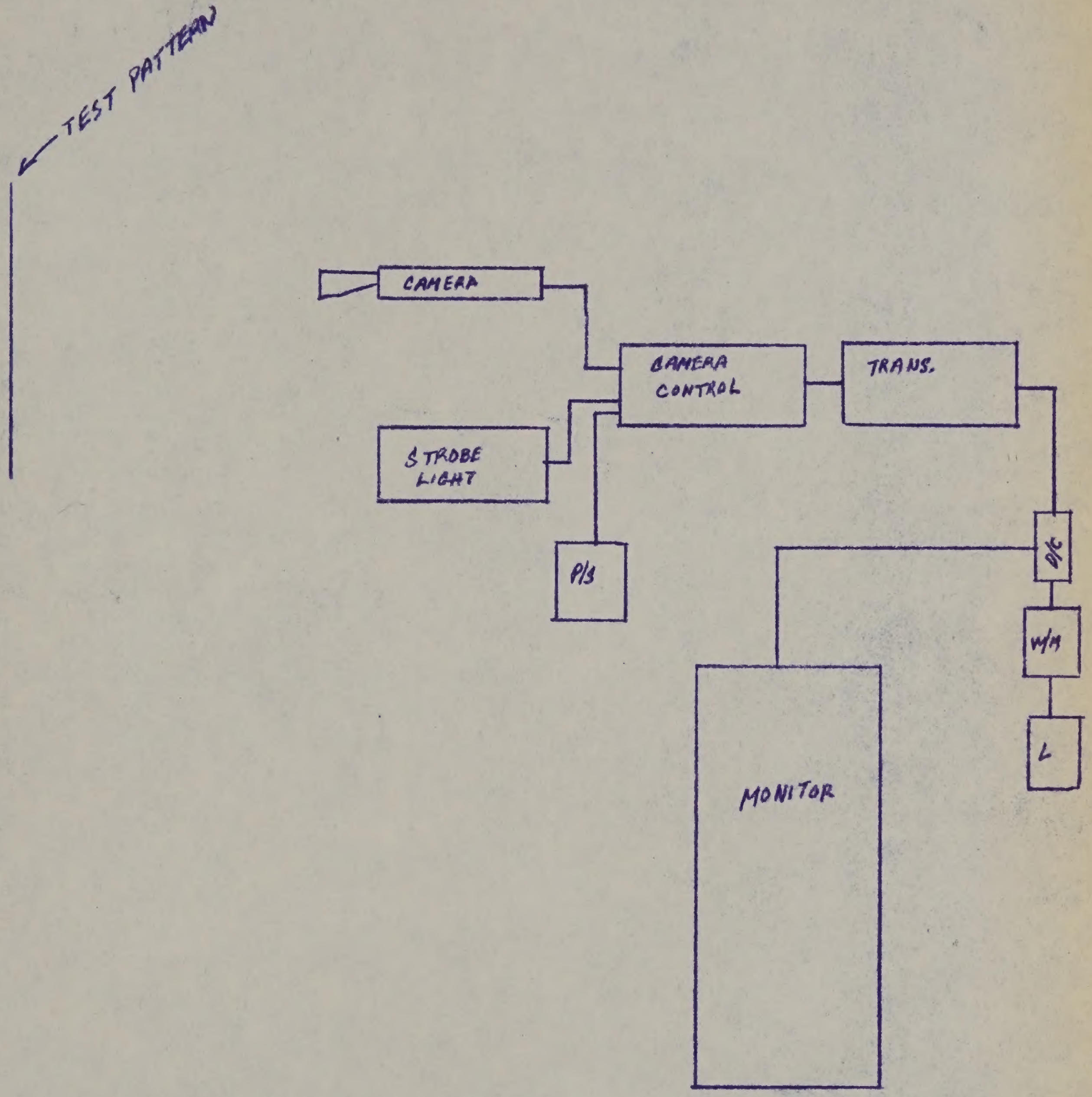

FIG. # 7

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DWG
A
SIZE

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